



# **The Northern Gulf Institute**

## **2011 – 2021 Strategic Plan**



# **NGI**

**NORTHERN GULF INSTITUTE**

a NOAA cooperative institute

# 2011 – 2021 Strategic Plan

## The Northern Gulf Institute

A NOAA Cooperative Institute

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**The Northern Gulf Institute (NGI)** is a partnership of Mississippi State University, the University of Southern Mississippi, Florida State University, Louisiana State University, the Alabama Dauphin Island Sea Laboratory, and the National Oceanic and Atmospheric Administration. The NGI 2011-2021 Strategic Plan describes our unique identity and capabilities, the purpose of the work we do, our long-term goals and our near-term implementation activities.

## **Who We Are – Academic Experts for Northern Gulf of Mexico Ecosystems Research**

*The Northern Gulf Institute engages nationally and internationally recognized academic experts who provide intellectual and technological capacity to address comprehensive regional ecosystem approaches to science and management in the northern Gulf of Mexico*

## **What We Do – Research for Holistic Understanding of Northern Gulf of Mexico Ecosystems**

*NGI Mission: The Northern Gulf Institute conducts research that builds an integrated, comprehensive understanding of natural and human impacts on northern Gulf of Mexico ecosystems and associated economies to improve its management*

## **What We Seek – Transformations in Regional Ecosystem-Based Management**

*NGI Vision: Research-driven transformations in regional ecosystem-based management enable managers and communities to improve the resilience and health of ecosystems and people and the sustainability of resources in the northern Gulf of Mexico*

## **Long-Term Goals – Improve Ecosystem Science and Use and Strengthen the Northern Gulf Institute**

### **Research Goals**

*Understand the structure, function, and services of ecosystems across land-sea, ocean-atmosphere, and coastal waters-deep sea interfaces*

*Synthesize information across disciplines to reduce uncertainty and to forecast ecosystem responses*

*Develop applications that address regional management needs*

### **Engagement Goals**

*Develop, facilitate, disseminate, and transition research, knowledge, and applications*

*Build internal and external connections for institutional sustainability*

## **Near-Term Priorities – Guide for Implementation Plans for next Three to Five Years**

*Address research needs to understand impacts of Gulf oil and other contaminants, excess nutrients, hypoxia, ocean acidification, sea-level rise, storms, and other natural and anthropogenic hazards*

*Develop capabilities for Integrated Ecosystem Assessment and comprehensive modeling for coastal scenario-based planning and forecasting to improve management of ecosystems and resources*

*Continue time-series monitoring for water quality, fisheries management, and habitat restoration*

*Involve regional agencies and managers in the development of research directions, the implementation of applications, and the pursuit of related funding opportunities*

*Support development of new scientists with regionally focused, hands-on research experiences for graduate and undergraduate students and provide information for educators and citizen scientists*

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# Introduction

## Overview of the NGI 2011 – 2021 Strategic Plan

This plan describes a vision that the Northern Gulf Institute (NGI) will follow over the next ten years along a course set forth in its mission, goals, and actions. Understanding the importance of accountability, NGI will track progress towards its research and engagement goals. NGI leadership will use this plan to make decisions about selection of research in response to changes in priorities, events, and resources. The goals and objectives in this plan and their alignment with national and regional agency outcomes will ensure that NGI research remains relevant and addresses regional priorities (*see Appendices A through E*).

**NGI Vision:** Research-driven transformations in regional ecosystem-based management enable managers and communities to improve the resilience and health of ecosystems and people and the sustainability of resources in the northern Gulf of Mexico

**NGI Mission:** The Northern Gulf Institute conducts research that builds an integrated, comprehensive understanding of natural and human impacts on northern Gulf of Mexico ecosystems and economies to improve its management.

### NGI Research Goals:

- (1) Understand the structure, function, and services of ecosystems across land-sea, ocean-atmosphere, and coastal waters-deep sea interfaces  
NGI uses adaptive sampling, remote sensing *in-situ* monitoring, surveying, experimental approaches, and process studies to conduct research on natural systems and on the natural and human factors that influence them. Short- to long-term research and management needs drive the approaches to data collection, integration, archival, retrieval, and experimental design.
- (2) Synthesize information across disciplines to reduce uncertainty and to forecast ecosystem responses  
NGI integrates research across land-sea and ocean-atmosphere interfaces using a combination of analyses, ecosystem modeling, and Earth-system modeling. This synthesis of research approach reduces scientific uncertainty and improves holistic understanding of changes in the structure and function of ecosystems and effects on ecosystem services and society.
- (3) Develop applications that address regional management needs  
NGI uses management needs to drive the development of applications from data, knowledge, and tools. Researchers identify specific regional needs, develop applications, and establish a transition process or framework for projects and partners. Applications from research include capabilities for ecological forecasting, integrated ecosystem assessments, and ecosystems-based coastal and marine spatial planning.

### NGI Engagement Goals:

- (1) Develop, facilitate, disseminate, and transition research, knowledge, and applications  
NGI develops and facilitates research opportunities with strong ties to its core strengths and research priorities. NGI works with administrators and researchers at federal, regional, and state agencies involved in related efforts to leverage research capacity and impact. NGI builds multi-institutional and interdisciplinary research teams to respond to opportunities and support the successful completion of those projects. NGI researchers disseminate and transition findings and developments to scientific and resource management communities and partners involved with engagement efforts.
- (2) Build internal and external connections for institutional sustainability  
The NGI Program Office, Council of Fellows, Executive Council, and Advisory Council communicate in order to plan, partner, and align NGI research objectives with national, regional, and state management priorities. NGI engages government, academia, industry, and community leaders in this process. NGI provides opportunities for graduate and undergraduate students and interns to conduct research. NGI supports educator professional development, coastal marine education centers, and citizen science groups.

## About NGI

NGI was developed in response to the National Oceanic and Atmospheric Administration's (NOAA) recognition of a need for integrated research and technology that more effectively addressed the needs of the northern Gulf of Mexico. NOAA's Office of Oceanic and Atmospheric Research (OAR) issued an Announcement of Federal Funding Opportunity (OAR-CIPO-2006-2000641) on April 26, 2006, establishing NGI with an initial five-year term. NOAA awarded NGI a second five-year term in 2011, after a NOAA Science Advisory Board review rated NGI as "outstanding."

NGI is a partnership of five academic institutions that collaborate to address science and management priorities in the northern Gulf of Mexico. Mississippi State University leads this collaboration, in partnership with the University of Southern Mississippi, Florida State University, Louisiana State University, the Alabama Dauphin Island Sea Laboratory, and NOAA scientists at laboratories and operational centers across the region. NGI's geographic focus is on the coastal zone from coastal ocean areas inland to upland watersheds from the Sabine River in Louisiana east to the Suwannee River in Florida. This region is a rich and interdependent system of great complexity and provides vital resources and services to the Gulf region and the Nation. The themes that guide all NGI-funded research are:

- Ecosystem-based management
- Geospatial data, information, and visualization in environmental science
- Climate change and climate variability effects on regional ecosystems
- Coastal hazards and resiliency

NGI leverages its efforts through collaboration with other regional partners; and its approach to regional issues, problems, and opportunities aligns with the NOAA Next Generation Strategic Plan, the Interagency Ocean Policy Task Force National Priority Objectives, the Gulf of Mexico Alliance Governors' Action Plan II, the Sea Grant Gulf of Mexico Research Plan, the Gulf of Mexico Regional Collaboration Team Implementation Plan, and the Mississippi-Alabama Sea Grant Consortium Strategic Plan (*see Appendices A through E*). NGI has established Memoranda of Agreements with a number of regional entities who share interests in the Gulf of Mexico including the Mississippi-Alabama Sea Grant Consortium, the Harte Research Institute, the Gulf of Mexico Coastal Ocean Observing System Regional Association, and the Mississippi Department of Marine Resources.

NGI core values form the foundation on which we perform work and conduct ourselves:

**Leadership** through research and engagement with our stakeholders

**Excellence** in our programs, organization, and people

**Collaboration** in our research and engagement, enhancing capabilities to respond to the needs of the northern Gulf of Mexico and stakeholders

**Professionalism** in our work through expertise, commitment, diligence, and high ethical and professional standards

**Responsiveness** in our approach to being stakeholder driven and alert to the needs of the northern Gulf of Mexico region

## Functional Structure for Research

In October 2010, the NGI Council of Fellows adopted a long-term research direction and structure to address the foundational hypothesis that *natural and anthropogenic perturbations significantly impact the Northern Gulf of Mexico ecosystem structure, function, and services*. Expanding on the foundational hypothesis, four broad questions guide the development of long-term research efforts to understand linkages between ecosystems and humans:

- (1) What are the ecological effects of climate variability and climate change?
- (2) What are the ecological effects of coastal hazards?
- (3) How do living marine resources respond to climate variability, climate change, and coastal hazards?
- (4) What forecasting tools and natural resource management measures produce positive social outcomes while having the least negative impacts on ecosystem services?

The research hypothesis and broad questions cut across the NGI Research Themes of ecosystem-based management; geospatial data, information, and visualization in environmental science, climate change and climate variability effects on regional ecosystems; and coastal hazards and resilience.

The newly adopted structure is comprised of three overlapping clusters: “Observe,” “Understand,” and “Apply.” The focus of the research clusters are (1) to conduct regular monitoring of and targeted research on northern Gulf ecosystems and their components; (2) to synthesize these observations and individual research efforts in a holistic manner to improve overall understanding of ecosystems and the impacts on them; and (3) to develop applications that support an ecosystem approach to management. Regional management needs are key drivers of activities for each area.

As a group, the NGI Fellows determine the overall research approach with an emphasis upon strong cross-cluster coordination and inter-institutional collaboration. This unified program approach framed by the research hypothesis and research structure informs the selection of specific research projects within larger research opportunities. This organizational framework will provide the structure for NGI research in the next ten years, including research that addresses the effects of the Deepwater Horizon Oil Spill.

## Near-Term Priorities

At the May 2011 NGI Conference, the NGI Council of Fellows adopted near-term priorities from the objectives set forth in this long-term strategic plan to guide the development of implementation plans for the next three to five years. These priorities provide a framework for making decisions about effective allocation of resources and directed efforts in areas of strength for NGI. NGI near-term priorities are to:

- Address research needs to understand impacts of Gulf oil and other contaminants, excess nutrients, hypoxia, ocean acidification, sea-level rise, storms, and other natural and anthropogenic hazards;
- Develop capabilities for Integrated Ecosystem Assessments and comprehensive modeling for coastal scenario-based planning and forecasting to improve management of ecosystems and resources;
- Continue time-series monitoring for water quality, fisheries management, and habitat restoration;
- Involve regional agencies and managers in the development of research directions, the implementation of applications, and the pursuit of related funding opportunities
- Support development of new scientists with regionally focused, hands-on research experiences for graduate and undergraduate students and with information for educators and citizen scientists.

## Measures of Success

The success of NGI will be the creation of new or improved knowledge and technology and its transition to applications for improved ecosystem-based management in the northern Gulf of Mexico. Two types of measures provide indicators of success for NGI: (1) goals and objectives from research projects and (2) organizational metrics from engagement and education efforts. Research project metrics feed into organizational metrics. Together these provide indicators about the effectiveness and efficiency of NGI, about the value of NGI research to our stakeholders, and about the visibility and branding of NGI. NGI will track two types of research use: (1) external use by the scientific community, resource managers, and by those involved in engagement and education efforts and (2) internal use by other NGI-funded researchers. Peer-reviewed documentation of NGI-funded research provides an established metric for the quality, rigor, and significance of research. In response to an NGI Executive Council recommendation, NGI will document the establishment and implementation of a transition framework and process. Tracking the allocation of funds provides information for accountability and management of resources and helps inform response to changes in priorities and to events. Documentation of alignment of NGI projects to the outcomes of other agencies provides information about leveraging resources, extending impact, and strengthening our ties with stakeholders. NGI will also track information about students who receive research experience through data about their education and career paths to show NGI's contribution to developing a science workforce. Increasing external knowledge of NGI promotes the visibility, branding, and recognition of the value of the organization and its work. Increasing internal knowledge within NGI is an organizational asset that promotes effective internal operations and coordinated, collective external communication. An NGI Metrics Plan will provide periodic updates in the following areas in addition to tracking goals and objectives of research projects:

- External use of NGI research by stakeholders in the scientific and resource management communities and by partners involved in engagement and education efforts
- Formal and informal recognition of NGI research
- Internal use of NGI research to support existing research or advance new opportunities
- Established framework that prepares research for use or improves the usability of research
- Leveraged efforts that extend the impact of NGI
- Acquisition of resources that sustain and grow NGI
- Allocation and alignment of resources with NGI goals
- Implementation plans that align with regional priorities and emphasize multi-institutional collaborations
- Graduate and undergraduate students who receive research experience through NGI
- Collaborations and strong relationships with key stakeholders in the scientific and resource management communities and with partners involved in engagement and education efforts
- Effective internal processes and working relationships

## NGI Strengths and Challenges

NGI as the NOAA Cooperative Institute in the northern Gulf of Mexico for ecosystem research provides NOAA and other national and regional agencies with academic expertise to fill research, workforce, and capability needs. NGI is uniquely positioned to engage the academic research community in this region to support agency and management needs for comprehensive regional ecosystem approaches to science and to management applications. The leaders of NGI are nationally and internationally recognized academic scientists and provide access to the region's best subject matter experts and technology. The regional collaboration among NGI researchers, their use of combined institutional strengths, and their development of next-generation scientists bring advanced and long-term capabilities that contribute to its vision of transformations in ecosystem-based management (see Figure 1 Research Strengths of NGI Partner Institutions).

The nationally recognized collaboration among the five research institutions of NGI is an unmatched strength in the northern Gulf of Mexico. The NGI administrative structure and the established relationships across its partner institutions facilitate rapid, regionally focused, and coordinated response to priority needs. The collaborative strength of NGI was highlighted in two recent events: (1) the 2010 ten million dollar award by the Gulf of Mexico Research

Initiative to NGI – the only award to a multi-state and multi-institutional organization – which provided the means for research teams in the field to re-direct their work for immediate response to the Deep Water Horizon oil spill; and (2) a 2009 external review of the research, education, and outreach programs of NGI by an independent NOAA Science Advisory Board which found that NGI is “transforming the partnerships within the Gulf Coast region, with considerable positive impact” and that “the institutional commitments to strong collaborations have fostered a good collegial atmosphere among the partners.”

**Figure 1 Research Strengths of NGI Partner Institutions**

<b>Mississippi State University</b>	<ul style="list-style-type: none"> <li>Spatial Technologies and Remote Sensing Systems</li> <li>Watershed, River, and Estuarine Hydrodynamics, Sedimentation, and Water Quality</li> <li>Meteorology</li> <li>Visualization</li> <li>Economic Assessment</li> <li>High Performance Computing</li> <li>Coastal Research and Extension/Outreach</li> </ul>
<b>Florida State University</b>	<ul style="list-style-type: none"> <li>Atmospheric, Ocean and Coastal Ocean Prediction</li> <li>Regional Climate Variability and Climate Change Impact</li> <li>Interdisciplinary Observation and Modeling of Marine Ecosystems</li> <li>Marine and Fisheries Ecology</li> <li>Computational Needs of Marine Science and Meteorology</li> </ul>
<b>Louisiana State University</b>	<ul style="list-style-type: none"> <li>Oceanography and Coastal Sciences</li> <li>Wetland Ecology and Restoration</li> <li>Fisheries Ecology and Management</li> <li>Coastal Processes Science and Engineering</li> <li>Pollution Ecology</li> <li>Water Resource Research and Land-Surface-Dynamics</li> <li>Societal Risks and Resiliency in the Coastal Zone</li> <li>Numerical Modeling, GIS, Remote Sensing and Computational Technology</li> </ul>
<b>The University of Southern Mississippi</b>	<ul style="list-style-type: none"> <li>Ocean Observing Systems</li> <li>Coupled Physical-Biological Ocean Modeling</li> <li>Marine Mapping, Charting, and Hydrographic Science</li> <li>Marine Fisheries and Ecosystem Research</li> <li>Coastal Remote Sensing</li> <li>Water Quality, Trace Element, and Geochemical Analytical Facilities</li> <li>Marine Microbiology</li> <li>Coastal Sedimentology and Micropaleontology</li> <li>Oceans and Human Health</li> </ul>
<b>Alabama Dauphin Island Sea Laboratory</b>	<ul style="list-style-type: none"> <li>Marine Science Education K-12 and Public Outreach through the Estuarium</li> <li>Region-wide marine education through BayMobile outreach program</li> <li>Habitat Conservation and Restoration</li> <li>Experimental Marine and Estuarine Ecology</li> <li>Coastal Oceanography</li> </ul>

Some of the challenges that NGI faces are similar to those that other state and federally-funded research institutions experience such as the national economic crisis and budget reductions; shifts in political support for addressing climate, environmental, and education issues; and an increasing need for specialized expertise and technology for research. Public and private organizations have increased accountability for funds they expend on research for issues affecting the health and wellbeing of people and the sustainability of natural and economic resources. Other

challenges that NGI faces are more specific to its organizational structure as a multi-institutional partnership and its physical location not co-located with a NOAA laboratory and in a region that has historically been under-funded in ecosystem-related research.

The commitment of NGI to maintain its existing strengths and to grow collaborative capacity will enable NGI to address these challenges and develop opportunities from them, as most recently evident in its response to the *Deepwater Horizon* oil spill. NGI has the regionally specific research expertise, experience, and credibility to perform the tasks that entities with resources to support research require. In addition to other activities described in Engagement Goals One and Two, NGI plans to use a four-pronged approach to aggressively grow financial and in-kind support for NGI research and increase visibility and branding of NGI:

1. NGI will develop science teams to reach out to regional NOAA field offices and other public and private agencies. The NOAA NGI Science Coordinator, the NGI Chief Scientist, and select NGI Research Fellows and Principal Investigators will form teams and organize visits to NOAA regional field offices and to other agencies. The purpose of these visits will be to build relationships between researchers and NOAA scientists and other stakeholders, listen to their issues and needs, and demonstrate the capacity of NGI to address them. NGI research teams can give seminars about NGI, present papers or reports about relevant research, or discuss and demonstrate products that others could use or adapt, given resource support. The alignment of NGI Research and Engagement Goals in this strategic planning process with the NOAA Next Generation Strategic Plan and with other national and regional agency outcomes provides a tool for researchers to identify needs of specific NOAA line offices and regional laboratories and of other organizations that can grow NGI resources (*see Appendices A – E*).
2. The NGI Program Office leadership serves as the “face of NGI” at NOAA headquarters and line offices. The NGI Director and selected team members will continue to promote awareness of NGI to NOAA leadership by providing research accomplishments, demonstrating the capacity of NGI research institutions to meet NOAA needs, and reinforcing the message that NGI is their Cooperative Institute for ecosystem research and scientific workforce in the Gulf of Mexico. In addition to promoting the message of NGI to NOAA leadership, NGI will seek information from NOAA leadership to help research teams more effectively engage NOAA field scientists and meet their needs. NGI leadership will increase efforts to engage members of the NGI Executive Council both on an individual level and collectively in group meetings.
3. NGI researchers will pursue awards through traditional NOAA Cooperative Institute projects and through projects at partner academic institutions. The NOAA NGI Science Coordinator and the NGI Chief Scientist will continue to meet with researchers at individual institutions to increase their awareness and knowledge of the processes for Cooperative Institute project funding. They will provide assistance as needed to researchers at each institution to leverage NGI resources for growth of existing research or pursuit of new opportunities within their individual organizations.
4. The NGI leadership will continue to promote and build upon the successes of NGI research and transitions. The NGI leadership (Program Office and Fellows) will identify research teams who have or are currently working on NGI research and who are engaged with user stakeholders. The NGI leadership, including the coordinating science leads, will work with these proven teams to extend or grow their resources by aggressively promoting their work and successes to others who have similar needs and to other scientific and professional organizations for increased exposure and dissemination. An internal product or tool that could support other or new researchers in their efforts to grow resources and opportunities is to develop a catalogue of successful inter-institutional relationships and provide electronic access to that information on the NGI website. To accurately promote the NGI identity and the partner organizations when referencing NGI researchers, the Program Office will encourage this terminology for reference: NGI-funded researchers at [insert name of research institution].

The following list provides an overview of NGI strengths that its leadership can draw upon to address challenges and to develop opportunities that can sustain and grow this successful multi-institutional research partnership:

- Nationally recognized working collaborations and relationships among the partner research institutions
- Nationally recognized excellence as an institution and for its research, education, and outreach
- Nationally and internationally recognized science experts at its partner research institutions
- Formal agreements of support and active involvement with recognized regionally focused organizations
- Collaboratively developed long-term strategic and near-term implementation plans
- Alignment with national and regional agency outcomes that leverage the impact of NGI
- Successful working relationships with researchers at NOAA regional offices and laboratories
- Commitment to building strong research teams using the best researchers at any and all NGI partner institutions and to bring in expertise as needed from other institutions
- Established administrative processes for efficient transfer of funds from agencies to universities
- An Advisory Council comprised of stakeholder representatives from state, regional, and federal agencies who provides information on emerging regional priority issues and opportunities for collaborative efforts
- An Executive Council comprised of NOAA executive leads who provides information on NGI direction, NOAA initiatives, and relevant administrators and researchers within NOAA for NGI to contact
- Demonstrated transitions of research to applications
- Development of new scientists with regionally focused research experience to provide a ready workforce pool
- Partners with expertise and experience in communicating research findings in order to engage regional resource managers, educators, and the general public
- NOAA cooperative agreement for rapid funding of research and education with and for federal initiatives

# Strategy, Outcomes, and Objectives for NGI Research Goal One

## *Understand the structure, function, and services of ecosystems across land-sea, ocean-atmosphere, and coastal waters-deep sea interfaces*

### Strategy

NGI uses adaptive sampling, remote sensing *in-situ* monitoring, surveying, experimental approaches, and process studies to conduct research on natural systems and on the natural and human factors that influence them. Short- to long-term research and management needs drive the approaches to data collection, integration, archival, retrieval, and experimental design.

NGI research will address advanced science needs for an informed ecosystem approach to management with these actions:

- To build appropriate scientific data, NGI will (1) conduct observations to establish baseline ecological and social conditions; (2) continue long-term observations and monitoring to inform adaptive management processes and to support regional and federal initiatives; and (3) improve observing and monitoring through experimental approaches.
- To support understanding of connections among ecosystem components and influences, NGI will conduct analyses and process studies and develop experimental designs.
- To improve access and use of ecosystem data, NGI will support regional data portals and data management plans.

### Outcomes

During the next ten years, NGI research projects will contribute to these outcomes:

- Improved knowledge base that informs regional ecosystem research for science-based decisions
- Improved regional ecosystem research through experimental designs
- Improved data resources and access for regional ecosystem research and management capabilities

### Objectives

During the next ten years, NGI research projects will include these objectives that provide evidence of progress in addressing science needs for an informed approach to ecosystem management:

1. Identify key variables and indicators that reflect ecosystem attributes and stressors that should be observed and monitored for use as benchmarks of ecosystem health and services.
2. Develop and use ecological characterizations to describe important components and processes of ecosystems and their functional relationships and the relationships of outside influences.
3. Use existing and experimental approaches to build trends in time and space for physical, ecological, and socio-economic indicators that support regional management decisions through (a) observations for weather prediction, fisheries health, and socio-economic change; and (b) monitoring for air, water, and habitat quality; climate change and variability effects; hazards resilience; and nutrients and pollutants in coastal transition zones.
4. Use existing and experimental approaches to collect and use real-time data to detect rapid changes in ecosystem environments and data on societal norms, practices, and beliefs to support coastal resilience research.
5. Use existing and experimental remote data collection technology such as unmanned aircraft systems, autonomous underwater vehicles, sensors, buoys, and platforms.
6. Contribute to the development and population of data portals and data management plans that standardize collection and requirements across jurisdictions and sectors and that combine data to support regional ecosystem research.

## Strategy, Outcomes, and Objectives for NGI Research Goal Two

### *Synthesize information across disciplines to reduce uncertainty and to forecast ecosystem responses*

#### Strategy

NGI integrates research across land-sea and ocean-atmosphere interfaces using a combination of analyses, ecosystem modeling, and Earth-system modeling. This synthesis of research approach reduces scientific uncertainty and improves holistic understanding of changes in the structure and function of ecosystems and effects on ecosystem services and society.

NGI research will address needs that challenge the development of capabilities to reduce uncertainty and forecast ecosystem responses with these actions:

- To make connections between science knowledge and management needs, NGI will conduct multi-disciplinary research that combines physical, ecological and social data.
- To develop a holistic approach to understanding ecosystems, NGI will combine disparate research analyses and process studies and use a multi-site comparative system as a method to grow ecosystem-level knowledge.
- To develop capabilities for improved accuracy in forecasting response of ecosystem functions and services to acute and incremental events and changes, NGI will conduct research on measurement systems, predictive models, and interpretive activities.

#### Outcomes

During the next ten years, NGI research projects will contribute to these outcomes:

- Improved science frameworks for understanding regional ecosystem dynamics and services and the processes that connect interactions between natural and human systems
- Improved understanding of regional systems interdependence, data integration, risk, and uncertainty
- Advances in consistent and reliable ecosystem analyses and modeling that integrate physical, ecological and socio-economic data and information
- Contributions to new or strengthening of broadly accepted conclusions about key issues or relationships of regional ecosystems and socio-economic conditions

#### Objectives

During the next five to ten years, NGI research projects will include objectives that provide evidence of progress in addressing these science needs that challenge the development of forecasting capabilities:

1. Identify and explain scientific uncertainties and reduce uncertainties for management decisions and advance science on regional ecosystems.
2. Improve understanding of mechanistic systems and processes that contribute to the value of coastal and marine habitat services.
3. Provide cross-habitat connections among living marine resources and impacts from natural and human sources using ecological and social data for improved understanding of riverine and estuarine fisheries ecology and food webs.
4. Link ecosystem indicators to drivers and stressors for assessment model frameworks.
5. Combine specific system interactions and ecosystems experiments to develop predictive models.
6. Incorporate responses of marine and freshwater organisms to improve capabilities to forecast biogeochemical and ecological responses to coastal and ocean acidification.
7. Develop analytical and numerical modeling approaches to study the processes of severe storms and to better understand their impact on coastal ecosystems, ecosystem services, and society.
8. Develop behavioral models to gain understanding of coastal resident preferences and perceptions on risks and restoration and subsequent behavior.
9. Develop modeling capabilities to understand spatial and temporal variations, processes, and trends of water quality and to predict fate and transport of sediment and pollutants in riverine, estuarine, coastal, and ocean waters with a holistic perspective.
10. Integrate hydrologic models and best management practices for research on resilient and sustainable coastal communities.

# Strategy, Outcomes, and Objectives for NGI Research Goal Three

## *Develop applications that address regional management needs*

### **Strategy**

NGI uses management needs to drive the development of applications from data, knowledge, and tools. Researchers identify specific regional needs, develop applications, and establish a transition process or framework for projects and partners. Applications from research include capabilities for ecological forecasting, integrated ecosystem assessments, and ecosystems-based coastal and marine spatial planning.

NGI research will address needs that challenge the development of applications for ecosystem-based management with these actions:

- For integrated applications that address complex issues, NGI will incorporate ecosystem dynamics, processes, and services that connect natural and human systems.
- For continual refinement of applications development, NGI will incorporate improved science data and understanding and incorporate stakeholder feedback.

### **Outcomes**

During the next ten years, NGI research projects will contribute to these outcomes:

- Applications that enable regional ecological and social forecasting, assessment, and planning that address specific regional management and information needs
- Transition frameworks that enable stakeholders to test and refine applications for management use
- Applications that improve the ability to communicate the effects of and response to natural and human impacts on regional ecosystems and on ecosystem services and society

### **Objectives**

During the next five to ten years, NGI research projects will include objectives that provide evidence of progress in addressing needs for applications development:

1. Incorporate updates based on new science data to application products such as management strategy evaluation frameworks or web-based dynamic documents and tools.
2. Develop applications that include:
  - Integrated ecosystem assessments;
  - Coastal and marine spatial plans;
  - Watershed management plans;
  - Regional forecasting systems with nested high-resolution grids that use global ocean or basin-scale data to provide open ocean lateral boundary conditions;
  - Visual analytic tools to include high-resolution static and dynamic mapping systems; and
  - Tools to evaluate effects of:
    - climate variability and change (drought, floods, sea-level rise, temperature);
    - population, industry, and economic changes;
    - hydrologic, land, and Gulf management practices;
    - catastrophes and hazards (natural and man-made); and
    - habitat degradation and restoration.
3. Develop tools for weather predictions.
4. Involve stakeholders in the transition process or framework to validate prototype models, tools, plans, and assessments.

# Strategy, Outcomes, and Objectives for NGI Engagement Goal One

## *Develop, facilitate, disseminate, and transition research, knowledge, and applications*

### **Strategy**

NGI develops and facilitates research opportunities with strong ties to its core strengths and research priorities. NGI works with administrators and researchers at federal, regional, and state agencies involved in related efforts to leverage research capacity and impact. NGI builds multi-institutional and interdisciplinary research teams to respond to opportunities and support the successful completion of those projects. NGI researchers disseminate and transition findings and developments to scientific and resource management communities, and partners involved with engagement efforts.

NGI engagement will address needs that challenge research development and success with these actions:

- To bring research opportunities to fruition, NGI will proactively pursue connecting stakeholder needs with NGI research capabilities and funding resources.
- To achieve successful research outcomes, NGI will actively support researchers to engage stakeholders throughout the research and transition process.

### **Outcomes**

During the next ten years, NGI engagement activities will contribute to these outcomes:

- Sustained long-term research efforts in core priority areas
- Diverse resources support research activities
- Researchers receive formal and informal scientific recognition
- Research transitions address regional priority stakeholder needs

### **Objectives**

During the next five to ten years, NGI engagement activities will include objectives that provide evidence of progress in addressing researcher and stakeholder needs:

1. Develop and maintain strong relationships with national and regional stakeholders to address mutual goals by (a) coordinating with regional efforts to provide access to data, models, and training through workshops, meetings, and events; (b) supporting efforts of partners with formal and informal agreements with NGI; (c) pursuing in-person interaction with NOAA and other agencies with a Gulf focus; (d) participating in NOAA CI meetings; and (e) meeting with leads at NOAA regional laboratories.
2. Develop science plans that align with regional priorities and guide funding to emphasize multi-organizational collaborations, regional impacts, and transition processes or frameworks.
3. Use strategic working relationships that connect researchers, stakeholders, and resources to advance promising multi-year research opportunities by (a) facilitating stakeholder communication of needs to researchers; (b) connecting researchers with leadership at agencies with potential funding resources; and (c) facilitating development and submission of white papers and proposals.
4. Improve and maintain an administrative infrastructure that supports research teams and transition efforts for successful research activities by (a) providing electronic access to NGI institutional documents, publications, reports, presentations, and news and events; (b) supporting assembly of multi-institutional, interdisciplinary research teams; (c) providing support for process for contract awards and report requirements; (d) facilitating researcher engagement of stakeholders in transition efforts; (e) convening researchers and stakeholders at the NGI Annual Conference; and (f) recognizing, honoring, and publicizing researcher achievements.
5. Communicate and disseminate research opportunities, activities, findings, and developments to NGI stakeholders and the broader science community by (a) developing and disseminating materials and web content that promotes researchers' work and publications; (b) initiating and encouraging coverage of NGI activities and research in media (press releases, news articles, television stories) and in partner publications and websites; and (c) conduct speaker series, seminars, workshops, or training that feature NGI research.

# Strategy, Outcomes, and Objectives for NGI Engagement Goal Two

## *Build internal and external connections for institutional sustainability*

### **Strategy**

The NGI Program Office, Council of Fellows, Executive Council, and Advisory Council communicate in order to plan, partner, and align NGI research objectives with national, regional, and state management priorities. NGI engages government, academia, industry, and community leaders in this process. NGI provides opportunities for graduate and undergraduate students and interns to conduct research. NGI supports educator professional development, coastal marine education centers, and citizen science groups.

NGI engagement will address needs that challenge institutional sustainability with these actions:

- For engagement with key stakeholders, NGI will commit to sharing and reciprocity of plans and information.
- For continued and strong institutional and human capacity, NGI will contribute to the development of a science workforce and will provide research information for environmental and ocean literacy education.

### **Outcomes**

During the next ten years, NGI engagement activities will contribute to these outcomes:

- Coordinated regional research and engagement programs address priority needs
- Strong relationships among NGI member institutions, partners, and stakeholders
- Trained young professionals help meet science workforce needs
- Improved science supports environmental and ocean literacy

### **Objectives**

During the next five to ten years, NGI engagement activities will include objectives that provide evidence of progress in addressing institutional and education needs:

1. Coordinate efforts with partners who have common objectives across the Gulf region that focus on regional management needs and develop plans that reflect regional alignment.
2. Involve key stakeholders to assess progress of program goals and to revisit plans in light of new advances or changes in priority issues for strategic guidance.
3. Share information across sectors and jurisdictions to strengthen linkages among NGI stakeholders and contribute to a vital regional community and a strong NGI identity.
4. Promote active representation from stakeholder groups in NGI Councils by (a) convening the Council of Fellows quarterly, the Advisory Council Bi-annually, and the Executive Council annually; (b) responding to specific, actionable information and needs; (c) sharing information across and NGI Councils; and (d) fostering NGI identity and collegiality through meeting and events.
5. Provide research experiences and opportunities for students in order to develop new scientists by (a) involving students in NGI research projects; (b) providing internships that reflect the nation's diverse populations; (c) mentoring students across NGI institutions and partners; (d) increasing awareness of science careers and research opportunities; (e) recognizing innovation and excellence in student researchers; (f) disseminating information about student research experiences; and (g) facilitating employment of student researchers.
6. Provide research products to support environmental and ocean literacy needs by (a) leveraging partners' existing efforts that provide educators with training and information that incorporates NGI research; (b) develop materials that support application of ecosystem principles for public stewardship; and (c) incorporating NGI research into content for regional aquaria and science education centers.

## APPENDIX A

### Alignment of NGI Research Goal One with National and Regional Agency Outcomes

#### *Understand the structure, function, and services of ecosystems across land-sea, ocean-atmosphere, and coastal waters-deep sea interfaces*

##### **NOAA Next Generation Strategic Plan**

- Increased understanding of climate, weather, oceans, ecosystems, human activities, and their interrelationships (*Science and Technology Enterprise 1.1*)
- Reduced gaps in sustained environmental measures (*Science and Technology Enterprise 2.2*)

##### **Interagency Ocean Policy Task Force National Priorities**

- Address specific scientific requirements and research needs, including reconciling inconsistent standards, physical infrastructure, research platforms, organizations, and data management to identify critical gaps and ensure high quality data (*Priority 3*)
- Increase coordination of monitoring and mapping efforts to minimize climate change and ocean acidification impacts on marine ecosystems and coastal communities; and improve integration of ocean and coastal science into the broader climate dialogue and measures to improve understanding of the connections among land, water, air, ice, and human activities (*Priority 5*)
- Develop a comprehensive monitoring framework and integrate with State monitoring programs for water quality and sustainable land practices (*Priority 7*)
- Strengthen and integrate ocean and coastal observations, mapping, and infrastructure through: (1) addressing regional and national needs for ocean information, gathering specific data on key ocean and coastal variables required to support areas of special emphasis and needs; (2) use of unmanned vehicles and remote sensing platforms and satellites to gather data on the health and productivity of oceans and coasts; (4) data management, communication, access, and modeling systems for the timely integration and dissemination of data and information products (*Priority 9*)

##### **Sea Grant Gulf of Mexico Research Plan**

- Determine variables for indicators of ecosystem health and optimal methods to measure indicators, and better-define indices to evaluate the status of ecosystems
- Analyze the role of freshwater input on coastal wetlands and habitat change over time to determine the hydrologic requirements of healthy marsh systems and quantify effects of sediment discharge reduction on erosion rates and habitat loss; examine how river diversions and the placement of sediment impact water quality, sediment processes, shoaling, coastal processes, fisheries, habitat utilization by organisms, and marshes and other habitats; and determine changes in freshwater, nutrient, pollution, groundwater, and sediment input due to changes in pattern and quantity of precipitation
- Identify connections among habitats and connections between habitats and living marine resources; examine changes in habitat quality and quantity over time and identify the effects of changes on marine organisms including the threshold level of habitat quality and quantity to support sustainable living resources
- Determine the physical impacts of climate change on coastal and upland areas in terms of sea level change, rate of elevation change, shoreline change, loss of barrier islands, role of coastal development in preventing migration of marshes and other habitats, and change in inland, coastal and ocean hydrology; examine the public's perception of sea level change and evaluate hazard-related communications and people's change in behavior in relation to hazard mitigation; and determine how storm surge, subsidence, and sea level change affects ecosystems, native coastal habitat, wetland composition, saltwater intrusion, coastal flooding, cultures, agriculture, and human health
- Identify relationships between nutrient loading, eutrophication, hypoxia, and harmful algal blooms; examine their impacts on ecosystem health, seagrasses, and higher trophic organisms; and determine the effects of freshwater diversion on hypoxia

##### **Gulf of Mexico Alliance Governors Action Plan II**

- A monitoring network that identifies sources of pathogens and their impacts and provides information about status and trends of water quality
- Habitat conservation and restoration through an accurate tracking system that document gains and losses of Gulf habitats and ecosystem services
- Ecosystems integration assessment through developing regional data systems that contain environmental and economic data

##### **Gulf of Mexico Regional Collaboration Team Implementation Plan**

- Development of a Gulf of Mexico Hypoxia Data Portal and Management Plan (*Project C3*)
- Gulf of Mexico Integrated Ecosystem Assessment and Ecosystem-Based Coastal and Marine Spatial Planning: Application in the Northern Gulf (*Project C1*)

##### **Mississippi-Alabama Sea Grant Strategic Plan**

- Healthy coastal ecosystems through baseline data, standards, and indicators to support ecosystem-based approaches to land use, water, fisheries and other resource management, working with programs such as NOAA National Centers for Coastal Ocean Science, ocean observing programs, and others

## APPENDIX B

### Alignment of NGI Research Goal Two with National and Regional Agency Outcomes *Synthesize information across disciplines to reduce uncertainty and to forecast ecosystem responses*

#### NOAA Next Generation Strategic Plan

- Advanced understanding of key oceanic atmospheric, hydrologic, biogeochemical, and socioeconomic uncertainties related to changing climate (*Climate Adaptation and Mitigation 1.1.2*)
- Greater understanding of the effects of natural and human-induced contaminants on the health of humans and marine life (*Resilient Coastal Communities and Economies 4.4.1*)
- Increased understanding of climate, weather, oceans, ecosystems, human activities, and their interrelationships (*S&T 1.1*)
- Improved understanding of the processes contributing to, and impacts of ocean acidification, changes in ocean temperature and freshwater input, and sea level change (*S&T 1.2*)
- Improved understanding of ecosystems and the effects of human activities on the ecosystem and coastal communities and economies (*S&T 1.3*)

#### Interagency Ocean Policy Task Force National Priorities

- Inform and improve requirements for routine integrated ecosystem assessments and forecasts, including impacts related to climate change, to address vulnerability, risks, and resilience, and inform tradeoffs and priority-setting (*Priority 3*)
- Conduct research, observations, and modeling to forecast regional and local scale climate change and ocean acidification impacts and related vulnerabilities for natural resources, health, infrastructure, and livelihoods, including social and economic impacts; and evaluate potential social and economic costs related to sea-level rise, such as accelerating erosion, increased saltwater intrusion, and more severe coastal and inland flooding (*Priority 5*)
- Address major impacts of urban and suburban development and agriculture, including forestry and animal feedlots, on ocean and coastal waters (*Priority 7*)

#### Sea Grant Gulf of Mexico Research Plan

- Predict the impacts of current building and permitting practices on freshwater inflow and examine the effects of human manipulation on the amount, timing, and type of freshwater inflows and their impacts on natural resources and the environment; and predict the subsequent impacts of freshwater, nutrient, pollution, groundwater, and sediment inputs on geochemical and physical coastal processes and biological communities
- Model resource stability and sustainability and include interactions between fisheries, habitat, threatened and endangered species, ecosystem processes, and stressors to assist with making ecosystem-based management decisions
- Predict the physical impacts of climate change on coastal and upland areas in terms of sea level change, rate of elevation change, shoreline change, loss of barrier islands, role of coastal development in preventing migration of marshes and other habitats, and change in inland, coastal, and ocean hydrology; and predict socioeconomic impacts of climate and sea level change on population dynamics, community infrastructure, short- and long-term community demographic shifts, social capital, and commerce and shipping centers
- Evaluate the impacts of coastal development, land use, land cover, stormwater management, and wastewater management on eutrophication, nutrient loading, water quality, and the environment; and model the impacts of non-point source pollution on coastal resources

#### Gulf of Mexico Alliance Governors Action Plan II

- Design a regional process for comparing nutrient criteria across coastal and estuarine waters; and establish a comprehensive ecosystem approach to manage nutrient inputs and reduce impacts to coastal ecosystems
- Increase understanding of coastal hazards risks associated with living, working, and doing business in the Gulf region by residents and visitors

#### Gulf of Mexico Regional Collaboration Team Implementation Plan

- Gulf of Mexico Integrated Ecosystem Assessment and Ecosystem-Based Coastal and Marine Spatial Planning: Application in the Northern Gulf (*Project C1*)
- Ecological Effects of Sea Level Rise in the Northern Gulf of Mexico (*Project A2*)

#### Mississippi-Alabama Sea Grant Strategic Plan

- Healthy coastal ecosystems through research on ecosystem processes, the relationships between coastal stressors and long-term human and ecosystem health
- Hazard resilience in coastal communities through research to assess hazard-related risks and increase availability and usefulness of hazard-related information and forecasting

## APPENDIX C

### Alignment of NGI Research Goal Three with National and Regional Outcomes *Develop applications that address regional management needs*

#### NOAA Next Generation Strategic Plan

- National and regional assessments address particular needs of NOAA's unique stewardship responsibilities for ocean and coastal ecosystems, living marine resources, and water resources (*Climate Adaptation and Mitigation 1.2.4*)
- Positive economic and ecological impacts from improved water quality forecasts (*Weather Ready Nation 2.4.3*)
- Increased use of ecosystem-based approaches, such as integrated ecosystem assessments that incorporate climate considerations in fishery and protected resource decisions and in coastal and marine spatial planning processes (*Healthy Oceans 3.1.3*)
- Habitat assessments address the quantity and condition of habitats and the links between habitat and the productivity of living marine resource stocks and result in management actions to protect and restore priority habitats (*Healthy Oceans 3.3.4*)
- An enhanced geospatial framework and data are available to underpin decision support tools (*Resilient Coastal Communities and Economies 4.2.4*)

#### Interagency Ocean Policy Task Force National Priorities

- Adopt ecosystem-based management as a foundational principle for comprehensive management of oceans and coasts (*Priority 1*)
- Implement comprehensive, integrated, ecosystem-based coastal and marine spatial planning and management in the U.S. (*Priority 2*)
- Provide information necessary to inform management including mechanisms to transition research results into information products and tools (*Priority 3*)
- Conduct research on adaptive actions to identified climate change impacts and related vulnerabilities, such as ocean acidification, and develop ecological and economic resilience strategies and priorities for research and monitoring to address these strategies (*Priority 5*)
- Address the relative contributions of significant land-based sources of pollutants, sediments, and nutrients to receiving coastal waters, including recommendations of how to integrate and improve existing land-based conservation and pollution programs (*Priority 7*)

#### Sea Grant Gulf of Mexico Research Plan

- Research to support ecosystem health, best management practices for freshwater input and hydrology, sustainable populations of living marine resources, habitat restoration efforts, and resilience to natural hazards

#### Gulf of Mexico Alliance Governors Action Plan II

- Implement a Harmful Algal Blooms tracking and forecasting system that supports the reduction or elimination of blooms and can be used to minimize the negative effects; and reduce the risk of mercury-induced health effects from Gulf seafood consumption
- Provide improved conservation and restoration management tools through the application of science and technology
- Provide ecosystem decision-support tools to address priority issues within the Gulf
- Develop and implement strategies that reduce nutrient inputs; establish a comprehensive ecosystem approach to manage nutrient inputs and reduce impacts to coastal ecosystems; and increase the capacity of Gulf coastal communities so that nutrient impacts are better managed and reduced
- Provide tools to coastal communities to better understand the risks and impacts associated with coastal hazards, including climate change
- Provide enhancements for coastal communities, ecosystems, and economies to become more resilient to coastal hazards

#### Gulf of Mexico Regional Collaboration Team Implementation Plan

- Ecological Effects of Sea Level Rise in the Northern Gulf of Mexico (*Project A2*)
- Gulf of Mexico Integrated Ecosystem Assessment and Ecosystem-Based Coastal and Marine Spatial Planning: Application in the Northern Gulf (*Project C1*)

#### Mississippi – Alabama Sea Grant Strategic Plan

- Develop methodologies to evaluate ecosystem-based management approaches to assess their effectiveness and to guide future management efforts, working with the National Marine Fisheries Service and other federal, state, and local partners; work with NOAA and other partners to develop data, models, and training activities that support ecosystem-based planning and management approaches and share them with a wide variety of constituencies; and support research to improve the effectiveness of ecosystem restoration and identify promising new restoration approaches and technologies
- Strengthen Sea Grant's research activities and extension capacity to help coastal communities determine the sustainable carrying capacity of land, water, and other resources through assessments, scenarios, modeling, and other techniques; and support innovative research on land-use practices and building designs for energy and water conservation, coastal-ocean related renewable energy technologies and the other tools to help communities grow in sustainable ways
- Support research, development, and transfer of new technologies to keep the domestic seafood industry financially competitive and environmentally responsible
- Conduct research to assess hazard-related risks and increase the availability and usefulness of hazard-related information and forecasting for citizens, industries, and decision-makers in coastal communities

## APPENDIX D

### Alignment with National and Regional Outcomes for NGI Engagement Goal One *Develop, facilitate, disseminate, and transition collaborative research, knowledge, and applications*

#### NOAA Next Generation Strategic Plan

- Two-way communication with regional stakeholders, including regional governance initiatives, builds understanding, trust, and partnerships (*Engagement 2.4*)
- Key segments of society understand climate risks and use that knowledge to increase resilience to likely climate impacts (*Climate Adaptation and Mitigation 1.4.1*)
- Increased use of ecosystem-based approaches, such as integrated ecosystem assessments that incorporate climate considerations in fishery and protected resource decisions and in coastal and marine spatial planning processes (*Healthy Oceans 3.1.3*)
- Coastal decision makers and community leaders understand and use appropriate science-based tools and information for assessing hazard risk, vulnerability, and resilience (*Resilient Coastal Communities and Economies 4.1.2*)
- Coastal and great lakes managers use new or enhanced models, data, tools, and best practices for informed spatial planning, management, and stewardship of resources and ecosystems (*Resilient Coastal Communities and Economies 4.2.2*)

#### Interagency Ocean Policy Task Force National Priorities

- Support changes to local and regional ocean management systems that incorporate changing climate risks and elements of resilient systems for improved resiliency and adaptation to climate change and ocean acidification (*Priority 5*)
- Support interim and longer-term goals and mechanisms to facilitate collaboration among stakeholders to implement projects for regional ecosystem protection and restoration (*Priority 6*)

#### Sea Grant Gulf of Mexico Research Plan

- Use of research to improve ecosystem health, enable marine operations, improve stewardship of natural and cultural resources, and increase resilience to natural hazards

#### Gulf of Mexico Alliance Governors Action Plan II

- Strategic partnerships to fill environmental and ecological data gaps for improved ecosystems integration and assessment

#### Gulf of Mexico Regional Collaboration Team Implementation Plan

- The Climate and Resiliency Engagement Panel (*Project A1*)
- Integrated Ecosystem Restoration and Recovery Planning Services Plan (*Project F3*)
- Regional Collaboration to Support Long-Term Restoration Planning and Programs for the Gulf of Mexico Region (*Project C2*)
- Support the Gulf of Mexico Alliance (*Project F2*)

#### Mississippi-Alabama Sea Grant Strategic Plan

- Work with NOAA's Office of Ocean and Coastal Resource Management and Coastal Services Center, EPA's Office of Smart Growth and other federal, state, and local partners to disseminate assessment tools, model plans and ordinances, best management practices, alternative development approaches, and other techniques that will enable the citizens of our coastal zones to develop their coastal economies in environmentally sound ways
- Integrate, translate, and disseminate research findings and technological discoveries to the citizens, industries, and leaders who need them to capitalize on opportunities and make wise management decisions
- Strengthen partnerships to promote national, regional, and issue-related collaboration among federal and state programs and other partners in order to support more effective and integrated coastal decision-making

## APPENDIX E

### Alignment of NGI Engagement Goal Two with National and Regional Outcomes *Build internal and external connections for institutional sustainability*

#### NOAA Next Generation Strategic Plan

- Two-way communication with regional stakeholders, including regional governance initiatives, builds understanding, trust, and partnerships (*Engagement Enterprise 2.4*)
- Increased understanding and use of climate, weather, ocean, Great Lakes, and coastal environmental information to promote stewardship and increase informed decision making by stakeholders, educators, students, and the public who are interested in science (*Engagement Enterprise 1.1*)
- Increased numbers of underrepresented groups in the NOAA workforce (*Organization and Administration Enterprise 1.6*)

#### Interagency Ocean Policy Task Force National Priorities

- Identify priority issues in addressing emerging topics and changes in ocean and coastal ecosystems and processes to inform decisions and improve understanding (*Priority 3*)
- Better educate the public through formal and informal programs about the ocean and our coasts through: (1) addressing challenges, gaps, opportunities, and effective strategies for training and recruiting the current and next generation of disciplinary and interdisciplinary scientists, technicians, operators, managers, and policy-makers, with a particular focus on the needs of disadvantaged or under-served communities; (2) building public awareness, engagement, understanding and informed decision-making with specific emphasis on the state of ecosystems. (*Priority 3*)
- Establish and implement an integrated strategy that is science-based and aligns conservation and restoration goals at the Federal, State, tribal, local, and regional levels for regional ecosystem protection and restoration (*Priority 6*)

#### Gulf of Mexico Alliance Governors Action Plan II

- Implement environmental literacy with a focus on the Gulf and promote stewardship of the Gulf region

#### Gulf of Mexico Regional Collaboration Team Implementation Plan

- Climate and Resiliency Engagement Panel (*Project A1*)
- Regional collaboration to support long-term restoration planning and programs for the Gulf of Mexico Region (*Project C2*)
- Facilitate regional collaboration and stakeholder participation to support the National Ocean Policy and Coastal and Marine Spatial Planning in the Gulf of Mexico region (*Project D1*)
- Supporting teacher and student learning by providing access to NOAA expertise and tools (*Project F1*)
- Integrated Ecosystem Restoration and Recovery Planning Services Plan (*Project F3*)
- Outreach and Communication (*Project F4*)

#### Mississippi-Alabama Sea Grant Strategic Plan

- Provide life-long learning programs for people of all ages that enhance understanding of coastal and ocean environments and promote stewardship of healthy ecosystems
- Strengthen partnerships to promote national, regional, and issue-related collaboration among federal and state programs and other partners in order to support more effective and integrated coastal decision-making
- Advance coastal and ocean literacy through formal and informal learning opportunities in our schools, museums, aquariums, and other education forums, such as the on-line digital collections of the Aquatic Commons and the National Sea Grant Library
- Use Sea Grant's strong university partnerships to create new research and education opportunities in marine and aquatic science for undergraduate and graduate students and to develop information products and training opportunities that will help build the workforce capacity for coastal-related jobs and professions